CLAIMS

1. A method of processing high dimensionality data, comprising the steps of:

a) computing a matrix inverse and eigen functions according to a given number of limited observations of said data;

b) determining the dimensionality of said data according to said observations to provide an independent amount of discrimination necessary to process said data.

2. The method according to claim 1 wherein said data is speech frames.

3. The method and according to claim 2 wherein said speech is converted into speech feature vectors which are compared using a linear discriminant function, wherein the dimensionality of said feature vectors is between 1000 - 2000.

4. The method according to claim 3 wherein the step of computing includes generating an eigenvector that simultaneously diagonalizes the covariances in between speaker and between channel spaces.

5. The method according to claim 4 wherein the step of determining includes employing linear discriminant analysis on said data.

6. In a method of automatically verifying a speaker as matching a claimed identity wherein enrollment speech data of a known speaker is compared with test data, including the steps of processing spoken input enrollment speech data and test speech data into speech signals into a

series of frames of digital data representing the input speech, analyzing the speech frames by a speaker verification module which compares the enrollment and test features and generates respective match scores therefrom, and determining whether the test speech corresponds with the enrollment speech based upon the match scores, the improvement wherein:

the step of processing the spoken input enrollment and test speech data includes performing a feature extraction process on the enrollment and test speech data to convert variable input to fixed-length feature vectors that are independent of the order of words spoken or the speaking rate; and

the step of analyzing the speech frames by comparison includes computing a weighted Euclidean distance between the feature vectors by a discriminant analysis.

7. A method of speaker verification according to claim 6, wherein the feature extraction process further includes adapting the parameters of a set of "seed" word models for a predetermined number of vocabulary words, wherein the "seed" word models comprise hidden Markov (HMM) models and the adaptation is accomplished using a single pass of the Baum-Welsh algorithm.

8. A method of speaker verification according to claim 7, wherein the predetermined number of vocabulary words comprise five words, namely, "four", "six", "seven", "nine", and "ti."

9. A method of speaker verification according to claim 7, wherein the feature vectors are created by concatenating the state-mean vectors of the adapted HMM word models.

10. In a voice verification system for dividing speech utterances into speech frames and analyzing the frames independently to verify one speaker's voice as compared to another's, the improvement therewith of a method for verifying a speaker's voice by subjecting the speaker to an enrollment test for verification based upon the premise that speech utterances are a fixed set of words arranged in a randomized order, comprising the steps of:

causing said speaker to enroll by uttering from a vocabulary a predetermined number of combined words each word indicative of a number between one to nine and at least one bridging word "ti".,

adapting the parameters of a set of word models for said vocabulary words based upon input speech data to provide adapted word models,

concatenating said adapted word models to create a feature vector indicative of the average sound spectrum.

11. The method according to claim 10 including the further step of:

comparing said feature vector obtained from said enrollment with a feature vector obtained from a speech test to determine the identity of said one speaker voice.

12. The method according to claim 11 wherein said comparison is implemented by subjecting said vectors to a weighted Euclidean Distance computation.

13. The method according to claim 10 wherein the words indicative of numbers are four, six, seven and nine.

14. The method according to claim 10 wherein the steps of adapting includes adaption of the set of words by use of the Baum-Welsh algorithm.

15. The method according to claim 10 wherein said feature vector has a total dimensionality of 1568.

16. The method according to claim 10 further including the step of:

forming said feature vector for each speaker using the difference in vectors between a first and second speaker channel.

17. The method according to claim 16 wherein said different speaker vector approximates speaker speech with white noise channel differences.